

CLAIMS:

1. A lead frame provided with a frame (11A) having a first and a second connection conductor (4, 5), which connection conductors are each connected to the frame (11A) and provided with a non-engaging end portion, where, after deformation, the end portion of the second connection conductor can be positioned opposite the first connection conductor, and a semiconductor element can be placed between said connection conductors, characterized in that the end portion of the second connection conductor (5) within the frame (11A) is positioned outside the extension of the first connection conductor (4) and can be brought to a position opposite the position of the semiconductor element (3) by bending along a bending axis (B1) which is at an oblique angle with respect to the longitudinal axis of the end portion.
2. A lead frame as claimed in claim 1, characterized in that the end portion of the second connection conductor (5) has been brought to a position opposite the position of the semiconductor element (3) by bending along a bending axis (B1) which is at an oblique angle with respect to the longitudinal axis of the end portion.
3. A method of manufacturing a semiconductor device comprising the steps of:
 - providing a semiconductor element (3) having a first and a second electric connection region (1, 2) which connection regions are situated at opposite sides of the semiconductor element;
 - providing a lead frame as claimed in claim 2; and
 - fitting the semiconductor element (3) between the end portions of the first connection conductor (4), where connection means are used to make electroconductive connections between the connection regions (1) and the end portions.
4. A method of manufacturing a semiconductor device (10) comprising the steps of:

- providing a semiconductor element (3) having a first and a second electric connection region (1, 2), which connection regions are situated on opposite sides of the semiconductor element;
 - providing a lead frame having a frame (11A) with a first and a second connection conductor (4, 5), which connection conductors (4, 5) are each connected to the frame (11A) and provided with an exposed end portion;
 - applying the semiconductor element (3) to the end portion of the first connection conductor (4), an electroconductive connection between the first connection region (1) and the end portion being made by using a connection means;
 - moving the end portion of the second connection conductor (5) to a position outside the plane of the frame (11A) and opposite a location for the second connection region (2) of the semiconductor element (3),
 - making an electroconductive connection between the second connection region (2) and the end portion of the second connection conductor (5) by using a connection means,
- characterized in that the end portion of the second connection conductor (5) within the frame (11A) is positioned outside the extension of the first connection conductor (4) and is brought to a position opposite the position for the second connection region of the semiconductor element (3) by bending along a bending axis (B1) which is at an oblique angle with respect to the longitudinal axis of the end portion.
5. A method as claimed in claim 4, characterized in that the end of the end portion of the second connection conductor (5) is bent through approximately 90 degrees along the bending axis (B1) out of the plane of the frame (11A), and the end of the end portion is bent, along a further bending axis (B2) extending substantially parallel to the bending axis (B1) and at a distance therefrom corresponding approximately to the thickness of the semiconductor element (3), through an angle of approximately 90 degrees to the position of the semiconductor element (3).
6. A method as claimed in claim 5, characterized in that the end portion of the second connection conductor (5) is bent along the further bending axis (B2) or along another bending axis (B3) in such a manner that said end portion extends obliquely in at least one direction with respect to the end portion of the first connection conductor (4) which contains the position for the semiconductor element (3).

7. A method as claimed in claim 4, characterized in that the semiconductor element (3) is slid between the connection conductors (4, 5) after the end portion of the second connection conductor (5) has been bent to a position opposite the location for the second connection region (2) of the semiconductor element and opposite the end portion of the first connection conductor (4), the element (3) being clamped between the connection conductors (4, 5).

8. A method as claimed in claim 3 or 4, characterized in that

- a lead frame is chosen in which the first connection conductor (4) is provided with a hole (6) at a distance from the position of the semiconductor element (3);
- the semiconductor element (3) is placed on the hole and fixed by means of a suction device present below the hole (6), after which the semiconductor element is pushed between the connection conductors (4, 5) by means of a pusher member (7).

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9. A method as claimed in claim 3 or 4, characterized in that before the semiconductor element (3) is slid between the connection conductors (4, 5), the end portion of the first connection conductor (4) is maintained in a depressed position by means of a pressure member (8), until the semiconductor element (3) has been slid between the connection conductors (4, 5).

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10. A device (100) for carrying out a method as claimed in any one of claims 3 through 9, characterized in that the device (100) comprises:

- a transport mechanism for a lead frame (11) with at least two connection conductors (4, 5);
- positioning means (60, 66) for positioning a semiconductor element (3);
- pusher means (7) for pushing the semiconductor element (3) in between the two connection conductors (4, 5), of which one (5) is bent to a position above the position of the other one (4).

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11. A device (100) as claimed in claim 10, which further comprises means for bending an end portion of at least one of the connection conductors (4, 5) along a bending axis (B1) which makes an oblique angle with the longitudinal axis of the end portion.

12. A device (100) as claimed in claim 10, characterized in that it comprises pressure means (8) for pressing downward one (4) of the conductor tracks (4, 5), during the pushing against the semiconductor element (3).
- 5 13. A semiconductor device (10) comprising:
- a semiconductor element (3) which is provided with a first and a second electric connection region (1, 2), which connection regions are situated on opposite sides of the semiconductor element;
 - a first connection conductor (4) having a contact, and facing away therefrom.
- 10 an end portion which is electroconductively connected to the first connection region (1);
- a second connection conductor (5) having a contact, and facing away therefrom, an end portion which is bent along a bending axis (B1) which is at an oblique angle with respect to the longitudinal axis of the end portion, such that the end portion is situated opposite the second electric connection region, with which it is electroconductively
- 15 connected, while the contact is situated in the same plane as the contact of the first connection conductor; and
- an isolating envelope which leaves contacts facing way from the end portions of the connection conductors uncovered.
- 20 14. A semiconductor device as claimed in claim 13, characterized in that:
- the semiconductor element (3) is a semiconductor diode;
 - the second connection conductor (5) is u-shaped or j-shaped prior to bending,
 - for the oblique angle, an angle in the range between 70 and 80 degrees is selected, and
- 25 - the contacts of the connection conductors are in line with one another.
15. A semiconductor device as claimed in claim 13, characterized in that:
- the semiconductor element (3) is a semiconductor transistor with a third connection region; and
- 30 - a third connection conductor (5B) is present, which has a contact, and facing away therefrom, an end portion which is bent along a bending axis (B1) which is at an oblique angle with respect to the longitudinal axis of the end portion, such that the end portion is situated opposite the third electric connection region, with which it is

electroconductively connected, while the contact is situated in the same plane as the contact of the first connection conductor;

- the second and the third connection conductor (5A, 5B) are situated on either side of the first connection conductor (4).

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16. A semiconductor device as claimed in claim 13, and a lead frame as claimed in claim 1, characterized in that the first connection conductor (4) is provided with a hole (6) at a distance from the position for the semiconductor element (3).